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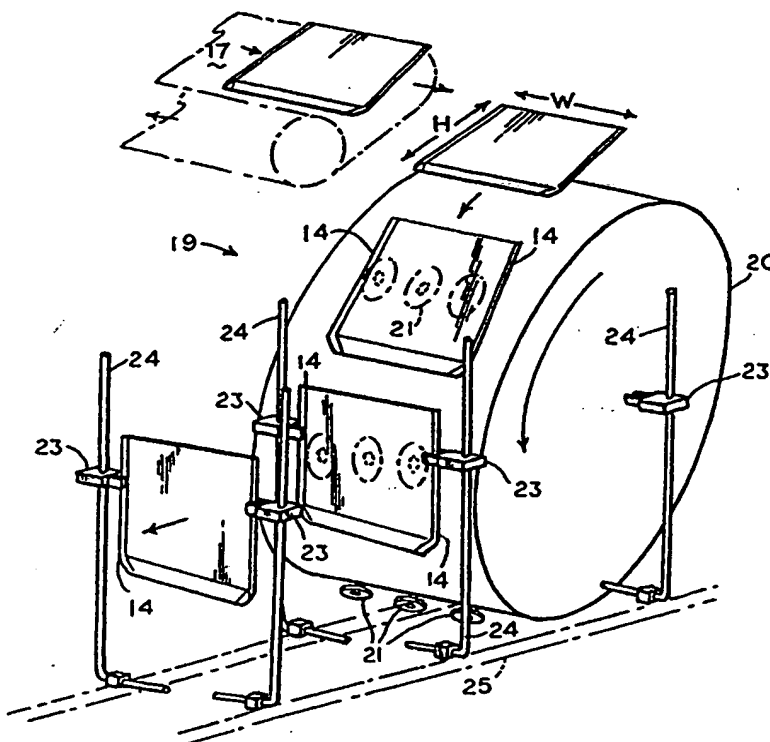
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(54) Title: METHOD OF FORMING CONTAINERS FOR AUTOMATED FILLING FROM A WEB OF FLEXIBLE MATERIAL

(57) Abstract

Flexible containers are produced by advancing a web of flexible material (10) through a sealing station where the web is sealed at spaced intervals to form a succession of container blanks (11) having in-line unsealed tops. The blanks (11) are severed from the web (10) as individual containers and then reoriented into mutually spaced, side by side position with their tops parallel one another above their bottoms. The container tops are then opened and advanced through a fill station (38) at a speed less than their speed of advance through the sealing station.



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10 METHOD OF FORMING CONTAINERS FOR AUTOMATED FILLING
 FROM A WEB OF FLEXIBLE MATERIAL

TECHNICAL FIELD

15 This invention relates to containers made of flexible materials and to methods
 of forming the containers for automated filling from a web of flexible material.

BACKGROUND OF THE INVENTION

20 Containers made of flexible materials, such as those made from thin sheets of
 plastics, offer distinct advantages over metallic cans, bottles and the like. For
 example, they are lighter, far less expensive to produce and easier to discard.
 However, they have had their own problems and limitations. For example, being
 made of thin plastic sheet material the manufacturing process typically requires a
 series of heat seals to be preformed on a web while the material is held stationary for
25 each seal. However, it is undesirable to incrementally move the containers while
 subsequently them with a consumer product, this being especially true with liquids
 which may slosh back and forth within the containers. Yet for efficiency, filling
 should occur in the same production line in which the containers are formed.

30 Containers made of flexible material are typically produced at high rates of
 speed. However, a high production speed does also hinder filling operations. This
 problem is especially prevalent with the filling of liquids, and particularly those
 liquids which must be filled slowly to avoid foaming. Unlike rigid containers such

as bottles, flexible containers must be individually held during filling and closing operations. This renders them ill suited for most speed reduction techniques used in rigid container lines such as, for example, by line bifurcations. Thus today the flexible container industry faces the dilemma of either production speed limits imposed for filling or simply accepting spillage and its attendant problems with high speed runs.

It therefore is seen that there remains a need for a method of forming flexible containers from sheet material and filling them with consumer products in a smooth and yet efficient and expeditious manner. Accordingly, it is to the provision of such that the present invention is primarily directed.

SUMMARY OF THE INVENTION

In a preferred form of the invention, a method of forming containers from a web of flexible material for filling comprises the step of sealing the web at spaced intervals as the web is advanced through a sealing station to form a succession of container blanks having in-line unsealed tops. The containers blanks are successively severed from the web along the seals. The severed individual containers are then oriented into mutually spaced, side by side positions with their tops generally parallel one another above their bottoms. The tops of the containers are spread open for filling. This reorientation enables the speed of the containers to be lower as they are then advanced through a fill station than their speed during container blank formation at the sealing station.

BRIEF DESCRIPTION OF THE DRAWING

Fig. 1 is a perspective view of a series of container blanks in their final stages of being formed in a web of flexible material and individually severed from the web while moving in-line along a linear path of travel.

Fig. 2 is a perspective view of a series of the containers being reoriented from the in-line linear path of travel shown in Fig. 1 to another linear path of travel with the individual containers now moving in a parallel relation with each other.

Fig. 3 is a perspective view of the series of containers next being opened in preparation for filling.

Fig. 4 is a perspective view showing the series of containers being filled with product.

5 Fig. 5 is a perspective view showing the filled containers being sealed.

DETAILED DESCRIPTION

10 With reference next in more detail to the drawings, there is shown in Fig. 1 a sheet or web 10 of thin plastic material of a two-ply construction consisting of a layer of heat sealable polyethylene and a layer of imprintable polyester. The web is folded and sealed at a sealing station 9 to produce a series of container blanks 11 having two overlaying sides 12. The web is successively severed by cutting dies 15 along the center of a side heat seal 13 which forms the side seams 14 of two adjacent container blanks 11 just past or downstream of a pair of drive rollers 16. The folding and heat sealing of the web during manufacturing practically necessitates that it be sequentially indexed in incremental movements during container production.

15 As each container blank 11 is severed from the continuous web it continues to travel upon a conveyor belt 17, shown in phantom lines, towards a reorientation station 19 shown in Fig. 2. Now being individual containers in collapsed form, each container has a defined width W and height H as indicated in Fig. 2. At the reorientation station 19 is a rotating transfer wheel 20 having sets of angularly spaced vacuum cups 21. This transfer wheel 20 may be of the type described in detail in U.S. Patent No. 5,415,615. The speed of the belt 17 is related to the speed of rotation of the wheel 20 such that the containers are sequentially delivered by the belt in single file onto successive vacuum cup sets. The rotating transfer wheel vacuum cups 21 grip the bottom sides of the containers as they are released from the belt and dispersed onto the wheel. Each container is held by the suction cups for a quarter rotation of the wheel thereby reorienting it from a horizontal orientation to an upright orientation. At this point they are gripped along their two opposite side seams 14 by pairs of pinchers 23 that are mounted for reciprocal, vertical movement along pairs

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of transfer rods or posts 24 coupled to a continuously driven, endless-loop chain 25 shown in phantom lines. For clarity these posts are shown with a constant spacing between the members of each pair although in actuality, they are converged by cams just downstream of the wheel 20. Unshown cams also activate the pinchers 23. Once
5 gripped by the pinchers suction is valved off to the suction cups which releases the containers from the wheel 20. The now upright containers are now positioned in sequence parallel with one another rather than coplanar as they had been in blank form while on the belt 17 as sections of the web.

The individual containers 11 are next moved by chain 25 to a preforming
10 station 29 shown in Fig. 3. At this station are continuously moving pairs of vacuum cups 30 that face one another that are mounted to unshown endless loop chains and vacuum lines. Also at the preforming station 29 is a continuous moving, forming carousel 31 that has a series of container formers 32 mounted to an endless loop chain 33 shown in phantom lines. Each container former 32 has a housing 34 and a
15 forming block 35 mounted to the housing 34 for reciprocal movement therein between an upper, withdrawn position and a lower extended position. The tops of each container is here opened by spreading movement of the vacuum cups 30. With their tops now open the forming blocks 35 are driven downwardly into the containers thereby then spreading them open. The blocks are then upwardly withdrawn from
20 them all as shown being done from right to left in Fig. 3.

As shown in Fig. 4, each container 11 is next moved to a filling station 38 having an endless series of hoppers 39 mounted to a continuous loop chain 40. Each hopper 39 has a spout 41 and a butterfly type gate 42 positioned therein. Again, with
25 synchronized horizontal movement of the hoppers 39 and containers, the pinchers 23 are raised along posts 24 by unshown camming members thereby elevating the container to a position where the hopper spout 41 extends down through their open tops. The hopper gates 42 then open whereupon product within the hoppers gravitates down into the container. The pinchers 23 then ride the camming member back down to their lower position thereby withdrawing the containers from the hopper
30 spouts.

As shown in Fig. 5, the containers 11 are finally moved to a sealing station 47 having a series of pairs of reciprocating heat sealing dies 48 mounted to a continuous loop chain 49, a segment of which is shown in phantom lines. With synchronized movement of the sealing dies 48 and containers, the pinchers 23 are raised along posts 24 by unshown camming members. The elevated position of the containers positions their open tops between pairs of continuously moving heat sealing dies 48. The heat sealing dies are then closed thereby heat sealing the top of the container, as indicated by the stippling at 50. The sealing dies are separated and the pinchers 23 returned to their lower position and opened to release the now filled and sealed containers.

Since the width W of each container body is greater than its depth D once it has been opened, as best shown in Fig. 3, their reorientation causes them to become compacted in the production line. This compaction is accompanied by a corresponding reduction in speed at the preforming and filling stations. In other words, if the distance from the center of the sides of adjacent container blanks in web form is reduced in half as they travel in side by side relation through the preforming and filling stations, their speed is also reduced in half. As another example, should the container center spacing prior to the transfer wheel be one foot, and the production speed set to 80 feet per minute, the production rate equals 80 containers per minute. Therefore, after reorientation at the reorientation station 19, the container center-to-center spacing is reduced to six inches and the post-reorientation speed is set to 40 feet per minute. This reduction in the speed of the containers greatly facilitates their filling with product by increasing their fill time during transit through a fill station of finite length. This increase in fill time is especially important when filling the containers with liquids that must be inserted slowly to avoid foaming. Additionally, the filling and sealing of the containers is preformed with a continuous motion, rather than with incremental, which further prevents sloshing and foaming. The reorientation also facilitates handling of the individual container once separated from the web.

5 It thus is seen that the new method enables containers to be produced from a continuous web of flexible material and individually filled in an efficient manner and yet at high rates of production. While the invention has been described and illustrated in its preferred form, it should be understood that many changes, additions, and deletions may be made thereto without departure from the spirit and scope of the invention as set forth in the following claims.

CLAIMS

1. A method of forming containers for filling from a web of flexible material comprising the steps of
 - (a) sealing the web at spaced intervals to form a succession of container blanks having in-line unsealed tops;
 - (b) successively severing container blanks from the web along the seals to form individual containers;
 - (c) reorienting the severed individual container into mutually spaced, side by side positions with their tops generally parallel one another above their bottoms; and
 - (d) spreading the unsealed tops of the containers open for filling.
2. The method of claim 1 wherein step (a) the web is advanced through a sealing station at a selected speed and wherein step (d) the containers are advanced through a preforming station at a speed less than said selected speed.
3. The method of claim 2 wherein step (a) the web is advanced through the sealing station along a linear path of travel and wherein step (d) the containers are advanced through the preforming station along another linear path of travel.
4. A method of forming and filling containers from a web of flexible material comprising the steps of
 - (a) advancing the web through a sealing station to form a succession of container blanks having in-line unsealed tops;
 - (b) severing the container blanks from the web;
 - (c) reorienting the severed individual containers into mutually spaced, side by side positions with their unsealed tops generally parallel one another above their bottoms;
 - (d) spreading the unsealed tops of the container open to form them into containers ready for filling; and
 - (e) advancing the containers through a fill station at a speed less than the speed of advance through the sealing station.

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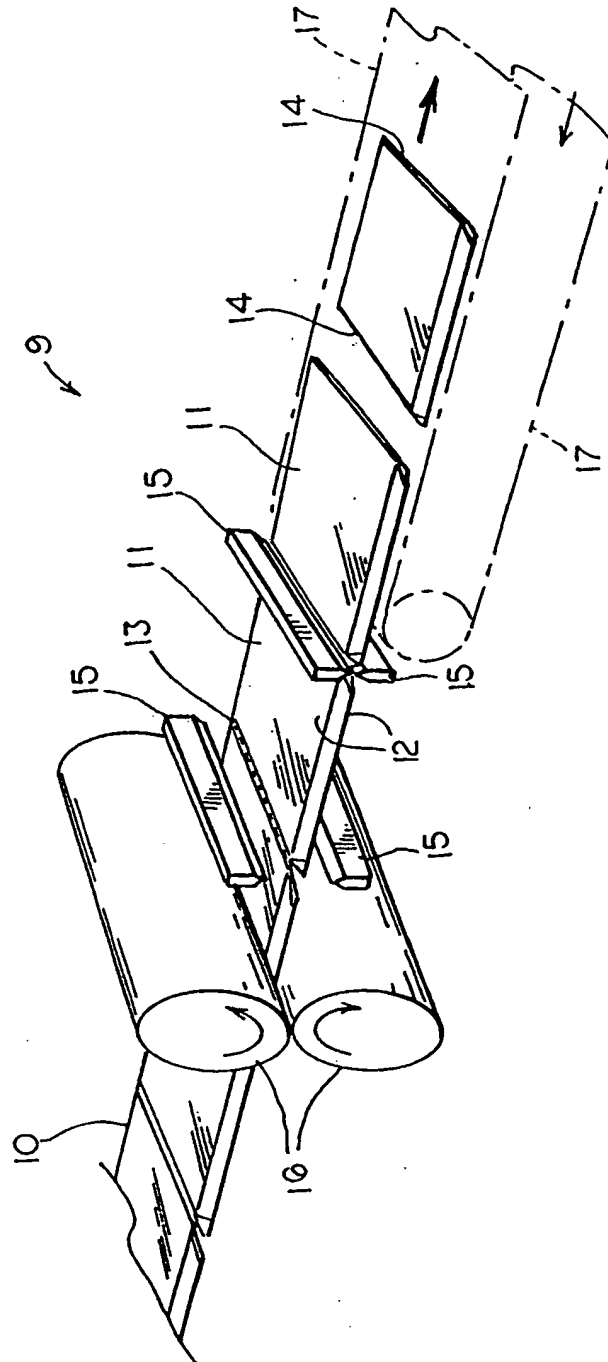


FIG. 1

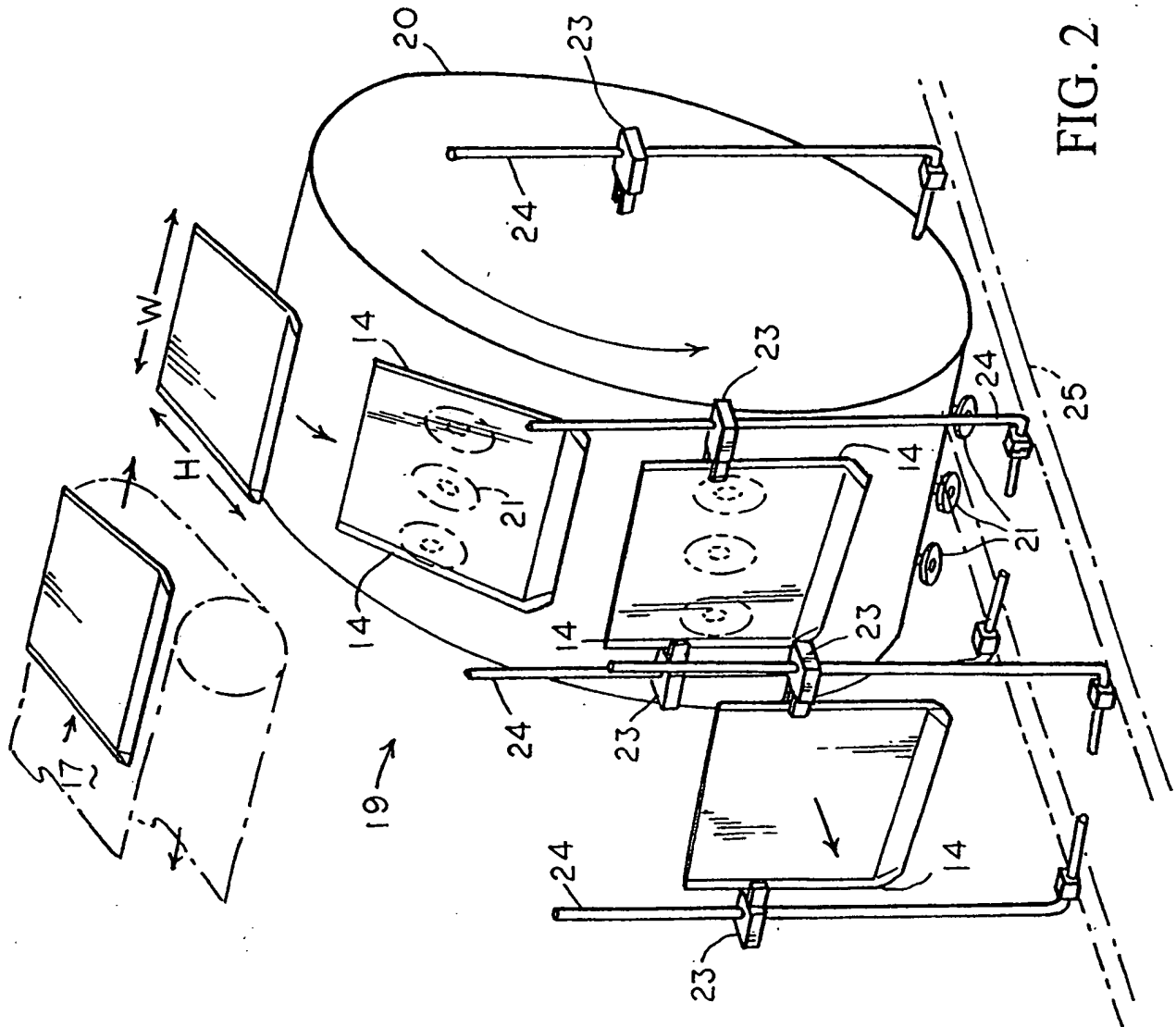
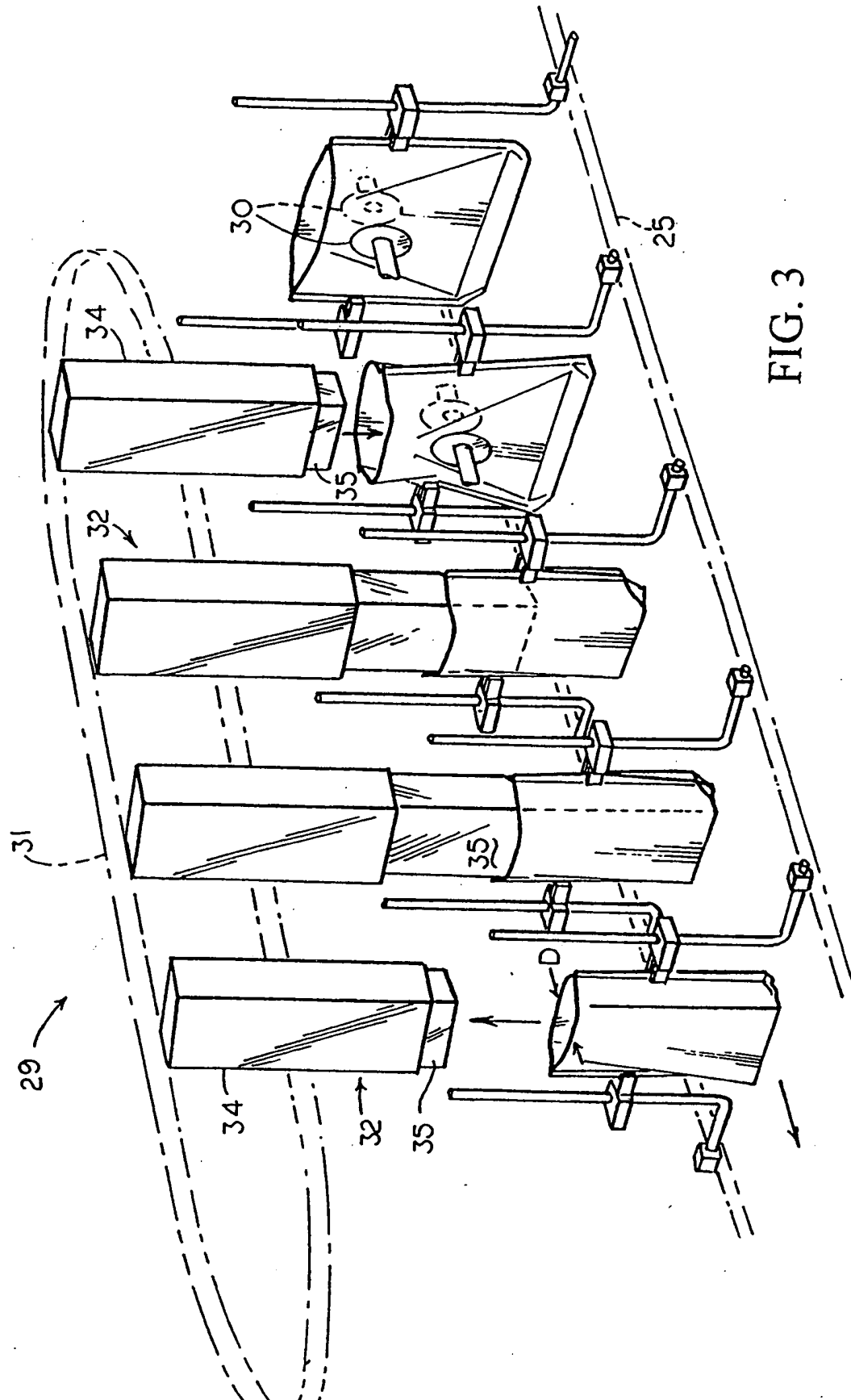


FIG. 2

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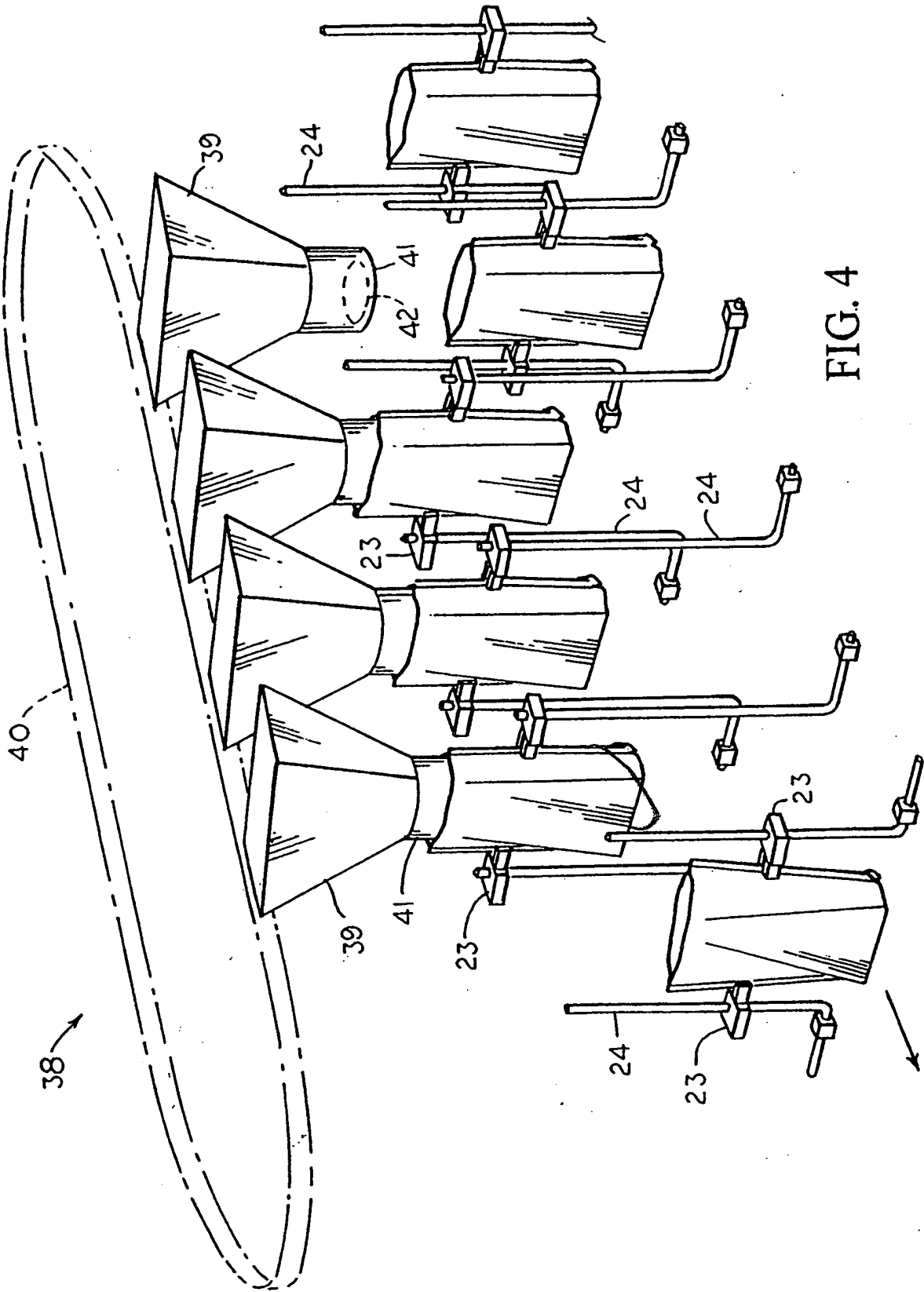


FIG. 4

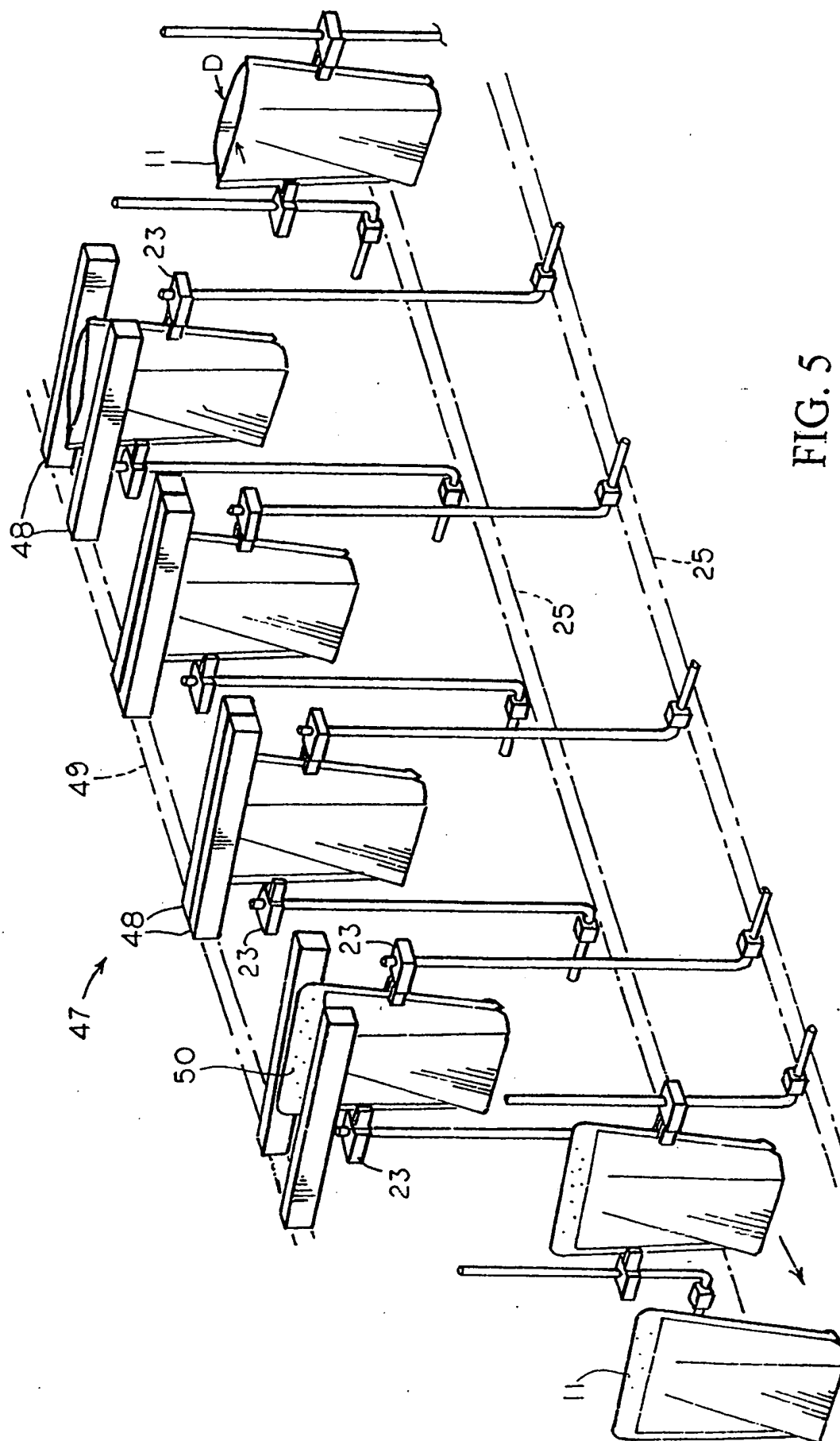


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/04428

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :B65B 43/04, 43/26; B31B 23/02, 33/74

US CL :53/250, 384.1, 455, 459, 468, 562; 493/197

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 53/249, 250, 381.1, 384.1, 385.1, 455, 459, 468, 469, 562, 570; 493/197

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Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,058,364 A (SEIDEN et al) 22 October 1991, see entire document.	1-4
X	US 4,330,288 A (RUSSELL et al) 18 May 1982, see entire document.	1-4
A	US 3,762,253 A (LOOMIS, JR. et al) 02 October 1973, see entire document.	1-4
A	US 5,348,398 A (BUCHANAN) 20 September 1994, see entire document.	1-4
A	US 3,855,907 A (JOHNSON et al) 24 December 1974, see entire document.	1-4



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